## A. Cover Sheet

1. Specify: ☒ agricultural project or ☒ individual application or
   ☐ urban project ☐ joint application
2. Proposal Title: OWID Palermo Canal Lining Project
3. Principal applicant: Oroville-Wyandotte Irrigation District
4. Contact: George M. Barber, Water Division Manager
5. Mailing Address: P.O. Box 581 Oroville, CA 95965
6. Telephone: (530) 533-4578
7. Fax: (530) 533-9700
8. E-mail: gbarber@owid.com
9. Funds requested-dollar amount: $183,000
10. Applicant cost shared funds pledged – dollar amount: $68,000
11. Duration-(month/year to month/year): July 2001 to Dec 2003
12. State Assembly and Senate districts and Congressional districts where the project is to be conducted:

    State Assembly 3rd District, State Senate 1st District, Congressional 2nd District
13. Location and geographic boundaries of the project: Butte County, near Oroville, CA Palermo Canal
14. Name and signature of official representing applicant. By signing below, the applicant declares the following:
    - the truthfulness of all representations in the proposal;
    - the individual signing the form is authorized to submit the application on behalf of the applicant;
    - the applicant will comply with the contract terms and conditions identified in Section11 of this PSP.

Oroville-Wyandotte Irrigation District _____
*(Printed name of applicant)* *(Date)*

_____
*(Signature of applicant)*

## B. Scope of Work

### Relevance and Importance

Summary

The Oroville-Wyandotte Irrigation District (OWID) proposes a project of lining sections of the District's Palermo Canal. Using District personnel and the use of a concrete pumping service, the District can accomplish the lining of 4,500 total feet of canal each year, at three or four separate locations for a total of 13,500 feet of canal. It is estimated that the completed project will produce savings of 695 AF of water annually. The estimated cost of the total project is $251,000. The District proposes that 73% ($183,000) of the cost be funded by the Water Use Efficiency Program. The District would pledge the use of District personnel and equipment at a cost of $68,000 to complete the project's funding.

Need

This project is needed to provide additional water in Lake Oroville for hydroelectricity generation and for transfer to downstream communities, and in the Feather River to improve aquatic ecosystem conditions. The proposed project will reduce losses in the canal, making more water available for storage in Lake Oroville and flow into the Feather River.

Nature, Scope and Objectives of the Project

The Oroville-Wyandotte Irrigation District's Palermo Canal is an earthen ditch constructed in the late 1800's. It delivers irrigation water in and around the community of Palermo in Butte County, primarily for olive and citrus growers. The current capacity of the main canal is 25 cfs. The main canal flows approximately 65,000 feet from Lake Oroville Dam to Lower Wyandotte Road with an average width of five feet and an average depth of three feet. At Lower Wyandotte Road the main canal is diverted into smaller canals totaling approximately an additional 112,000 feet with an average width of two feet. The District delivered an annual average of 6,980 AF to the Palermo Canal from 1992-1999.

The proposed project is the application of a three-inch nylon-fiber reinforced concrete lining to approximately 13,500 feet of main canal. This would be accomplished over a three-year period, lining three or four separate locations each year. Approximately 4,500 feet of canal would be lined each year. It is conservatively estimated that the Project would provide water savings of 695 AF annually. The District has completed similar projects successfully in the past. Locations would be chosen based on accessibility and historical knowledge of high leak areas.

The objective of the Project is to reduce the amount of water lost to seepage and leakage in the canal and make it available for storage in Lake Oroville and for flow in the Feather River. This project will provide water for hydroelectricity generation, transfers to downstream communities, and flow to improve aquatic ecosystem conditions on the Feather River, addressing Quantifiable Objective #38 in Sub-Region #5.

Technical/Scientific Merit, Feasibility, Monitoring, and Assessment

Methods, Procedures and Facilities

OWID calculates the loss on the main canal to be 0.0515 AF/ft annually. Lining the earthen ditch would significantly reduce the overall loss factor in the canal. With a reduction in loss factor, less water would be diverted from Lake Oroville annually. The project is calculated to reduce diversions annually by 695 AF. OWID will select locations for lining based on accessibility and leak history of locations. This is a feasible project and can be completed in conjunction with OWID's workload.

OWID will use District personnel to act as project coordinator. The project coordinator's duties will include identifying project locations, organizing materials and personnel, and obtaining the access required for completing the project. OWID would complete all canal preparation work with District personnel and equipment. OWID would then assist the concrete pumping service with the liner application. OWID will dedicate the personnel necessary to complete 4,500 feet each year. The District has had several successful projects lining canals with shotcrete.

Monitoring and Assessment

OWID tracks the volume of diversions and sales for each of its distribution systems. OWID will continue with this process to monitor the reductions in diversions resulting from the project. OWID has a velocity meter capable of determining the velocities in the main canal systems. OWID will conduct a study of the project locations prior to lining to determine the loss rates for each of the sections.

Schedule

The proposed schedule is shown in the timeline below (in year 2000 dollars):

| Planning Activities | YEAR ONE | | | |
|---|---|---|---|---|
| Construction Activities | | | July 01-Sept 01 | Oct 01-Dec 01 |
| Project Coordination | | | $2,985 | |
| Clearing and Grubbing | | | | $2,345 |
| Ditch Preparations | | | | $9,381 |
| Ditch Lining | | | | $69,652 |
| Quarterly Expenditure | | | $2,985 | $81,378 |
| Annual Expenditure | | | $2,985 | $84,363 |
| Length of Canal Lined | | | | 4500' |
| | YEAR TWO | | | |
| | Jan02-Mar02 | Apr02-Jun02 | July 02-Sept 02 | Oct 02-Dec 02 |
| Project Coordination | $1,408 | | $1,408 | |
| Clearing and Grubbing | | $1,106 | | $1,106 |
| Ditch Preparations | | $4,425 | | $4,425 |
| Ditch Lining | | $32,855 | | $32,855 |
| Quarterly Expenditure | $1,408 | $38,386 | $1,408 | $38,386 |
| Annual Expenditure | $1,408 | $39,794 | $41,202 | $79,588 |
| Length of Canal Lined | | 2250' | | 2250' |
| | YEAR THREE | | | |
| | Jan03-Mar03 | Apr03-Jun03 | July 03-Sept 03 | Oct 03-Dec 03 |
| Project Coordination | $1,328 | | $1,328 | |
| Clearing and Grubbing | | $1,044 | | $1,044 |
| Ditch Preparations | | $4,174 | | $4,174 |
| Ditch Lining | | $30,995 | | $30,995 |
| Quarterly Expenditure | $1,328 | $36,213 | $1,328 | $36,213 |
| Annual Expenditure | $1,328 | $37,541 | $38,869 | $75,082 |
| Length of Canal Lined | | 2250' | | 2250' |

## C. Outreach, Community Involvement, and Information Transfer

Outreach Efforts

OWID conducts monthly Board of Directors meetings that are open to public participation. A copy of this proposal will be provided to the Board of Directors and the public at the February 27, 2001 meeting. The project will primarily benefit the Palermo Community by providing a more reliable source of irrigation water. The lining of sections of the canal will reduce the possibility of major leaks and failures that can limit the supply available during the irrigation season. The proposed project has no impact to tribal entities in the area.

Training, Employment, and Capacity-Building Potential

OWID will use six to eight different District personnel for the project. The project will allow them to gain further experience and training on shotcrete and canal lining projects.

Information Transfer

OWID plans to advertise the project's progress and results at monthly Board of Directors meetings. OWID plans to highlight the project in its quarterly newsletter for customers and the public.

Cooperating Agencies

OWID anticipates the planning and construction of the project will not impact other agencies. If the proposal is accepted and scheduled, OWID will notify the local Department of Water Resources office of the project.

## D. Qualifications of the Applicants, Cooperators, and Establishment of Partnerships

External Cooperators

OWID will solicit the cooperation of property owners along the Palermo Canal. OWID has a history of good relationships with property owners and anticipates no problems with gaining access to the canal for the purposes of the project.

OWID continually works with customers to meet their needs during construction projects. The construction phase of this project is scheduled for the fall and spring seasons when irrigation demands are lower.

Partnerships

The partnership OWID has with the local concrete plant and concrete pumping services will be enhanced with this project. OWID attempts to use local businesses and contractors whenever projects are constructed.

Project Manager's Resume

The resume of the Project Manager is shown on the following page.

# George M. Barber

Registered Professional Engineer No. C51332

5040 Arden Way Paradise, California 95969

work (530) 533-4578 home (530) 877-1751


## PROFESSIONAL EMPLOYMENT

April 1995 to present

### WATER DIVISION MANAGER, OROVILLE WYANDOTTE IRRIGATION DIST.

- Responsible for operations of Water Division with 30 employees in Domestic, Irrigation, and Water Treatment.
- Established positive working relationship with General Manager and Board of Directors.
- Worked cooperatively with regulatory agency staff obtaining permits, approvals and agreements.
- Earned respect and confidence of employees.
- Implemented numerous operational and cost saving changes.
- Improved public relations with customers.

July 1992 to April 1995

### PROJECT ENGINEER, CALIF. DEPT. OF TRANSPORTATION.

- Acted as the Caltrans Tahoe Coordinator with the Tahoe Regional Planning Agency and the California Regional Water Quality Control Board, Lahontan Region for district projects within the Tahoe Basin.
- Calculated and designed horizontal alignment s, profiles, cross sections, rock slope protection systems, drainage systems, rock buttress systems, and engineer's estimates for erosion control and slope stabilization projects within the Tahoe Basin.
- Developed contract plans and special provisions including layouts, typical cross sections, drainage profiles and construction details.
- Acted as district specialist for slope stabilization and erosion control.
- Directed work of three transportation engineers.
- Coordinated with public utilities and public agencies.
- Directed public information meetings.

December 1990 to July 1992

### TRANSPORTATION ENGINEER, CALIF. DEPT. OF TRANS.

- Conducted hydrologic studies and determined watershed areas.
- Designed drainage improvements.
- Developed plans and engineer's estimates.
- Assisted design engineers using design software.
- Tested new design software.
- Developed project reports.
- Calculated and designed horizontal alignments, profiles, cross sections, rock slope protection systems, and drainage systems.
- Acted as Assistant Resident Engineer overseeing earthwork operations, paving operations, rock slope protection placement, and guardrail and detour construction.
- Calculated progress pay estimates.

## EDUCATION

1983-1990 California State University at Chico. Bachelor of Science in Civil Engineering

## ACCOMPLISHMENTS

Professional Engineer in Civil Engineering, California License No. C51332

## E. Costs and Benefits

### Budget Summary and Breakdown

| Description | Unit Costs (year 2000 dollars) | Annual Units | OWID | Program | OWID | Program | OWID | Program |
|---|---|---|---|---|---|---|---|---|
| **Salaries and Wages** | $/hour | Total Hours | | | | | | |
| Canal Preparation | $55.00 | 120 | $6,226 | | $5,874 | | $5,541 | |
| Shotcrete Application | $75.00 | 72 | $5,094 | | $4,806 | | $4,534 | |
| **Fringe Benefits** | 46.5% overhead | Total Hours | | | | | | |
| Canal Preparation | $25.58 | 120 | $2,896 | | $2,732 | | $2,577 | |
| Shotcrete Application | $34.88 | 72 | $2,369 | | $2,235 | | $2,109 | |
| **Supplies** | $/CY | CY | | | | | | |
| Shotcrete | $80.00 | 500 | | $37,736 | | $35,600 | | $33,585 |
| **Equipment** | $/hour | Total Hours | | | | | | |
| Bobcat Excavator | $23.00 | 120 | $2,604 | | $2,456 | | $2,317 | |
| Compressor | $10.00 | 72 | $679 | | $641 | | $605 | |
| **Services** | $/hour | Total Hours | | | | | | |
| Concrete Pumping Service | $350.00 | 72 | | $23,774 | | $22,428 | | $21,158 |
| **Travel** | | | | | | | | |
| None | | | | | | | | |
| **Planning and Design** | $/hour | Total Hours | | | | | | |
| Project Coordination | $30.00 | 72 | $2,038 | | $1,922 | | $1,814 | |
| **Fringe Benefits** | 46.5% overhead | Total Hours | | | | | | |
| Project Coordination | $13.95 | 72 | $948 | | $894 | | $843 | |
| **Annual Estimated Cost** | | | | | | | | |
| OWID | | | $22,854 | | $21,560 | | $20,340 | |
| Program | | | | $61,509 | | $58,028 | | $54,743 |

| **Total Estimated Cost** | | |
|---|---|---|
| OWID | $64,755 | |
| OWID Contingency - 5% | $3,238 | |
| OWID Subtotal | $67,992 | 27% |
| Program | $174,280 | |
| Program Contingency - 5% | $8,714 | |
| Program Subtotal | $182,994 | 73% |
| Total Project | $250,987 | 100% |

Budget Justification
This Budget is based on past experience of the District with shotcrete lining projects. The District proposes to commit all labor for the project with District personnel. The District has experienced good success with shotcrete lining projects. All preparation work is to be done by District personnel. District personnel will assist the concrete pumping service with the application of shotcrete.

**Benefit Summary and Breakdown**
The project will provide a benefit to the Quantifiable Objective 38 in Sub-Region 5. The project will provide additional water for storage in Lake Oroville for hydroelectricity generation and transfer to downstream communities, and in the Feather River to improve aquatic ecosystem conditions.

The District conducted an evaluation of the Irrigation System in preparation for an Irrigation Workshop that was held with the Board of Directors in January of 2000. The evaluation revealed that from 1992 to 1999 the Palermo Canal experienced an average loss of 83.6% from seepage and evapotranspiration (ET). This calculates to an average loss of 5,833 AF annually.

**ET Losses**
For evaluation purposes, the ET from the canal was estimated at 0.25 AF/acre/week. The ET annually for the Palermo Canal then was calculated to be 164 AF.

Main Canal
[(65,000 ft. x 5ft.)/43,560 ft²/acre) x 52 weeks x 0.25] = 96.99 AF annually

Delivery Canals
[(112,000 ft. x 2ft.)/43,560 ft²/acre) x 52 weeks x 0.25] = 66.85 AF annually

Total ET Losses = 164 AF annually

**Seepage Losses**
The loss in the Palermo Canal after accounting for ET is an average of 5,669 AF annually. The loss per foot of ditch was then calculated based on the average widths of the main canal and the delivery canals. The depth of the canal contributes to the loss factor for the ditches but this variable has not been adequately investigated to apply to this analysis.

Main Canal
65,000 ft. x 5 ft. = 325,000 ft² of canal bottom

Delivery Canal
112,000 ft. x 2 ft. = 224,000 ft² of canal bottom

Total Canal
325,000 ft² + 224,000 ft² = 549,000 ft² of canal bottom

Annual Loss per sq-ft
5,669 AF / 549,000 ft². = 0.0103 AF/ft² annual loss

Main Canal Loss per Foot
[(0.0103 AF/ft²) x 325,000 ft²] / 65,000 ft = 0.0515 AF/ft of main canal annual loss

**Water Savings of Lining Project**
The District proposes to line 4,500 feet of main canal per year for a three-year period.

Individual Annual Project Water Savings
(4500 feet) x 0.0515 AF/ft = 231.8 AF annually

Total Project Water Savings
3 projects x 231.8 AF = 695 AF annually

Quantifiable Benefit of Water Savings
Using the generation installed capacity information of the Oroville Dam project provided on the Department of Water Resources web site, a generation value of the water savings was calculated.

The transfer value is based on the transfer price of water between OWID and the Environmental Water Account.

| DWR Plant | | MW | cfs | AF-hr | (MW-hr)/AF |
|---|---|---|---|---|---|
| Edward Hyatt | Installed Capacity | 645 | 16,950 | 1401 | 0.46 |
| Thermalito | Installed Capacity | 114 | 17400 | 1438 | 0.08 |
| | | | | | 0.54 |
| | | (MW-hr)/AF | $/MW-hr | AF | $ value |
| | Generation Value | 0.54 | 65 | 695 | $ 24,382 |
| | | | $/AF | AF | |
| | Transfer Value | | 75 | 695 | $ 52,125 |
| | Annual Value of Water (year 2000 dollars) | | | | $ 76,507 |

The annual value of water calculated was used to determine the net present value of the proposed project. The life expectancy of the lining is estimated to be 20 years.

| Year | Benefit (year 2000 dollars) | 6% discount rate |
|---|---|---|
| 1 | $ 25,502.00 | $ 24,058.49 |
| 2 | $ 51,005.00 | $ 45,394.27 |
| 3 | $ 76,507.00 | $ 64,236.75 |
| 4 | $ 76,507.00 | $ 60,600.71 |
| 5 | $ 76,507.00 | $ 57,170.48 |
| 6 | $ 76,507.00 | $ 53,934.42 |
| 7 | $ 76,507.00 | $ 50,881.52 |
| 8 | $ 76,507.00 | $ 48,001.44 |
| 9 | $ 76,507.00 | $ 45,284.38 |
| 10 | $ 76,507.00 | $ 42,721.11 |
| 11 | $ 76,507.00 | $ 40,302.93 |
| 12 | $ 76,507.00 | $ 38,021.64 |
| 13 | $ 76,507.00 | $ 35,869.47 |
| 14 | $ 76,507.00 | $ 33,839.12 |
| 15 | $ 76,507.00 | $ 31,923.70 |
| 16 | $ 76,507.00 | $ 30,116.70 |
| 17 | $ 76,507.00 | $ 28,411.98 |
| 18 | $ 76,507.00 | $ 26,803.75 |
| 19 | $ 76,507.00 | $ 25,286.56 |
| 20 | $ 76,507.00 | $ 23,855.24 |
| | Net Present Value | $ 806,714.65 |

## Assessment of Costs and Benefits

Major Analysis Assumptions

- The depth of flow in the canals was assumed not to contribute to the loss rate in the canal. Time constraints in producing the proposal prevented addressing the varying ditch depth effects on the loss rates. Project locations will be chosen based on the District's knowledge of areas with above-average leak rates that also have adequate accessibility. Lining areas with above average leak rates should account for any errors that might result from this assumption.
- The ET rate was assumed to be 0.25 AF/acre/week. OWID determined that the ET is not a significant factor in loss rates for the canal.
- The water savings are calculated based on the average losses over the entire canal. A canal of this length will have varying loss factors based on terrain and soil type. Project locations will be chosen based on the District's knowledge of areas with adequate accessibility and with above-average leak rates. Lining areas with above-average leak rates should account for errors that might result from this assumption.
- The price of $65.00/Mwh for the generation value is based on the recent bids received by the California Department of Water Resources for the purchase of power on behalf of California power consumers.
- The price of $75.00/AF for the transfer value is based upon the transfer price of water between OWID and the Environmental Water Account.

Cost Benefit Summary

Present Value of Quantified Costs and Benefits

| **Project Quantified Costs** | |
|---|---|
| OWID Cost | $ 68,000 |
| Program Cost | $ 183,000 |
| **Project Cost** | **$ 251,000** |

| **Project Quantified Benefits** | |
|---|---|
| OWID Benefit | $ - |
| Department of Water Resources Benefit | $ 807,000 |
| **Project Benefit** | **$ 807,000** |

Non-Quantified Costs and Benefits

OWID

OWID will realize a non-quantified benefit of reduced maintenance of the sections of canal lined with the project.

OWID will realize a non-quantified cost by the redirection of workforce to the project.

CALFED Program

The CALFED program will realize a non-quantified benefit from the additional water provided in the Feather River to improve aquatic ecosystem conditions, addressing Quantifiable Objective #38 in Sub-Region #5.

Downstream Communities

Downstream communities will realize a non-quantified benefit from the additional water provided in the Feather River.